

REMARKS

Response to Examiner's Arguments

Applicants' response of 10/30/2006 has been entered in the record and considered.

"With respect to the rejections under 35 USC 103, the applicants' arguments have been considered but they are not persuasive for the reasons as discussed below. Claims 1-30 and 33-35 are rejected. Currently claims 1-30 and 33-35 are under consideration."

It is respectfully submitted that the Examiner has provided no arguments to rebut any of Applicants' Arguments of 10/30/2006. The Examiner's response is:

"The prior art of record shows the claimed invention as described in the previous paragraphs." [referring to the Office Action of 7/28/06]

Thus, the Examiner has not answered the Applicants' prior arguments regarding Burke, Weidman, and Wang, and has failed to comply with MPEP §707.07(f), which requires:

"707.07(f) Answer All Material Traversed [R-3]

...

Where the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it." [deletion and underlining for clarity]

Based on the above, Applicants are entitled to withdrawal of the rejections because the Examiner has failed to establish a *prima facie* case. Claims 1-30 and 33-35 are allowable under 35 U.S.C. §103(a) as being patentable over Burke in view of Weidman and further in view of Wang because:

"As adapted to *ex parte* procedure, Graham [v. John Deere Co.] is interpreted as continuing to place the 'burden of proof on the Patent Office which requires it to produce the factual basis for its rejection of an application under sections 102 and 103.'" [insertion and underlining for clarity] *In re Piasecki*, 745 F.2d 1468, 223 USPQ 785, 788 (Fed. Cir. 1984), quoting *In re Warner*, 379 F.2d 1011, 154 USPQ 173, 177 (C.C.P.A. 1967), *cert. denied*, 389 U.S. 1057 (1968).

Claim Rejections - 35 USC §103

Claims 1-30 and 33-35 are rejected under 35 U.S.C. §103(a) as being unpatentable over Burke et al. (U.S. Appl. Pub. No. 2005/0186782, hereinafter “Burke”) in view of Weidman et al. (U.S. Appl. Pub. No. 2003/0176058, hereinafter “Weidman”) and further in view of Wang et al. (U.S. Appl. Pub. No. 2005/0110152, hereinafter “Wang”).

Applicants’ previous remarks are clarified.

Initially, comments are provided to assist the Examiner in understanding the technology.

A bi-layered hard mask is defined by the function it performs in addition to the material it is made from.

A mask is used to pattern materials beneath it so a material that is not used to pattern materials beneath it by definition is not a mask.

Similarly, a hard mask is a relative term used to define the material of the mask being a hard material, such as an oxide or nitride, compared to photoresist, which is soft. Thus, a hard photoresist mask is an oxymoron and does not exist in the art.

A BARC is generally a photoresist (soft) material having a different refractive index from the overlaying photoresist as explained in Wang para. [0025]:

“[T]he material of the BARC layer 216 is similar to the material of the photoresist layer 220...” [deletion for clarity]

The above would also be obvious to those having ordinary skill in the art.

Thus, the Examiner statement in the Third Office Action of 7/28/06 (hereinafter the “Third Office Action”) is clearly incorrect that:

“Burke shows...the hard mask comprising a first layer (BARC 320) overlying a second hard mask layer HM2 (silicon oxide capping layer 318; [0038])” [deletion for clarity]

The Burke HM2 is a capping layer, which means that it is the last layer and does not perform a masking function for the layers beneath it.

More specifically, regarding independent claims 1, 9, and 20, Applicants respectfully traverse the rejections since the Applicants' claimed combination, as exemplified in claim 1, includes the limitation that is mutually contradictory in Burke and Weidman taken as a whole, and not shown in Wang of:

“patterning the intermetal dielectric layer and hard mask layers, and etching to form via openings extending through the intermetal dielectric layer and the hard mask layers;” [underlining for clarity]

The Examiner states in the Third Office Action of 7/28/06 (hereinafter the “Third Office Action”):

“patterning the IMD layer and hard mask layers, and etching to form via openings extending through the IMD and the hard mask layers (Fig. 3E)”

However, the Examiner stated in the Final Rejection of 5/5/06 (hereinafter the “Second Final Rejection”):

“Weidman shows the method as claimed in figures 1A-1H and corresponding text... The hard mask and IMD layers are patterned and etched to form open via and trench openings (figs. 1E-1H) for subsequent conducting metal fill.” [deletions and underlining for clarity]

And the Examiner was correctly persuaded by the Applicants that Weidman FIG. 1E shows the via opening 50 extending only partially through dielectric layer 10. It is not until subsequent processing in FIG. 1G that the via opening (no number) extends through the dielectric layer 14. Thus, taken as a whole, the combination of Burke vias extending through and Weidman vias not extending through is mutually contradictory and would render the Burke and Weidman combination inoperative.

Based on the above, it is respectfully submitted that independent claims 1, 9, and 20 are allowable under 35 U.S.C. §103(a) as being patentable over Burke in view of Weidman and further in view of Wang because:

“We have noted elsewhere, as a “useful general rule,” that references that teach away cannot serve to create a prima facie case of obviousness... If references taken in combination would produce a “seemingly inoperative device”, we have held that such references teach away from the combination and thus cannot serve as predicates for a prima facie case of obviousness.” *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984)[deletion and underlining for clarity]

Applicants also respectfully traverse the rejections of independent claims 1, 9, and 20 since the Applicants' claimed combination, as exemplified in claim 1, includes the limitation that is mutually contradictory in Burke, Weidman, and Wang taken as a whole of:

“forming a layer of via-fill material of bottom anti-reflective coating with photoresist over the intermetal dielectric layer, the via-fill material filling the via openings;” [underlining for clarity]

The Examiner states in the Office Action of 7/28/06 (hereinafter the “Third Office Action”):

“forming a layer of via-fill material of BARC coating 326, the via-fill material filling the via openings (fig. 3G);”

However, the Examiner stated in the Final Rejection of 5/5/06 (hereinafter the “Second Final Rejection”):

“Weidman lacks anticipation only in not explicitly teaching that the BARC is formed with photoresist and that the via is filled with photoresist;”

And the Examiner was correctly persuaded by the Applicants that Weidman FIGs. 1E-1H show that a BARC is not and cannot be used to fill the via opening without interfering with the Weidman process. Weidman uses the Weidman BARC (antireflective layer) 40 only used to fill the Weidman opening 32 before any portion of the Weidman via 50 is formed. Thus, taken as a whole, the combination of Burke filling the via openings with BARC, Weidman not filling the via openings with BARC, and Wang filling the via openings with photoresist are mutually contradictory and the combination of Burke, Weidman, and Wang would be inoperative.

Based on the above, it is respectfully submitted that independent claims 1, 9, and 20 are allowable under 35 U.S.C. §103(a) as being patentable over Burke in view of Weidman and further in view of Wang because of the holding in *In re Gordon*, *supra*.

Applicants also respectfully traverse the rejections of independent claims 1, 9, and 20 since the Applicants' claimed combination, as exemplified in claim 1, includes the limitation that is mutually contradictory in Burke, Weidman, and Wang taken as a whole of:

“patterning the via-fill material, intermetal dielectric layer and hard mask layers, and etching to form trench openings;” [underlining for clarity]

The Examiner states in the Office Action of 7/28/06 (hereinafter the "Third Office Action"):

"patterning the via-fill material, IMD and hard mask layers, and etching to form trench openings (fig. 3I);"

However, the Examiner stated in the Final Rejection of 5/5/06 (hereinafter the "Second Final Rejection"):

"Weidman shows the method as claimed in figures 1A-1H and corresponding text... The hard mask and IMD layers are patterned and etched to form open via and trench openings (figs. 1E-1H) for subsequent conducting metal fill." [deletions and underlining for clarity]

And the Examiner was persuaded by the Applicants that, since there is no Weidman via-fill material and the Wang via-fill material would render Weidman inoperative, any Weidman via-fill material cannot be patterned and etched to form the trench openings. Thus, taken as a whole, the combination of Burke filling the via openings with BARC, Weidman not filling the via openings with BARC, and Wang filling the via openings with photoresist is mutually contradictory and would be inoperative.

Based on the above, it is respectfully submitted that independent claims 1, 9, and 20 are allowable under 35 U.S.C. §103(a) as being patentable over Burke in view of Weidman and further in view of Wang because of the holding in *In re Gordon*, *supra*.

Generally with regard to the Burke, Weidman, and Wang, it is respectfully submitted that each reference has not been taken as whole but only portions of each reference have been combined and this is impermissible because the CAFC has stated:

"One cannot...pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992).

With regard to the conclusions of obviousness and motivation for the combinations proposed, Applicants respectfully traverse and timely request designation of the claims and the paragraphs of the references in which the motivations stated by the Examiner are shown pursuant to 37 CFR §1.104(c)(2), which specifies:

“In rejecting claims for want of novelty or for obviousness, the examiner must cite the best references at his or her command. When a reference is complex or shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified.”[underlining for clarity]

The dependent claims 2-8 and 33 depend from independent claim 1, dependent claims 10-19 and 34 depend from claim 9, and dependent claims 21-30 and 35 depend from claim 20 and are believed to be allowable since they contain all the limitations set forth in the independent claims from which they depend and claim non-obvious combinations thereof.

Based on all of the above and the differences in the processes between the claimed invention and Burke in view of Weidman and further in view of Wang, it is respectfully submitted that claims 1-30 and 33-35 are allowable because the US Supreme Court has held:

“[A] process patent can only be anticipated by a similar process. A mechanical patent is anticipated by a prior device of like construction and capable of performing the same function; but it is otherwise with a process patent.” *Carnegie Steel Co. v. Cambria Iron Co.*, 185 U.S. 403 (1902).

Based on all of the above, claims 1-30 and 33-35 are allowable under 35 U.S.C. §103(a) as being patentable over Burke in view of Weidman and further in view of Wang because:

“[T]he prior art reference (or references when combined) must teach or suggest **all** the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant’s disclosure.” [Bold for clarity] *In re Vaack*, 947 F2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)

Conclusion

In view of the above, it is submitted that the claims are in condition for allowance and reconsideration of the rejections is respectfully requested. Allowance of claims 1-30 and 33-35 at an early date is solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this

Application/Control No.: 10/767,292
Group Art Unit: 2812

paper, including any extension of time fees, to Deposit Account No. 50-0374 and please credit any excess fees to such deposit account.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Mikio Ishimaru". The signature is fluid and cursive, with the first name "Mikio" and last name "Ishimaru" clearly distinguishable.

Mikio Ishimaru
Registration No. 27,449

Ishimaru & Zahrt LLP
333 W. El Camino Real, Suite 330
Sunnyvale, CA 94087
Telephone: (408) 738-0592
Fax: (408) 738-0881
Date: February 20, 2007